

REMARKS

Claims 8-23 are pending in this application. By this Amendment, claims 8-23 are amended. Support for the amendments to the claims may be found, for example, in the previous claims and in the specification at page 6, line 21 - page 7, line 24; page 9, lines 4-20; page 14, line 1 - page 15, line 5; and Fig. 1. No new matter is added.

In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

I. Claim Objections

The Office Action objects to claims 9-23 as being respectively dependent on canceled claims 1, 2 or 3. By this Amendment, claims 9-23 are amended to variously depend from claims 8, 9 or 10, thus obviating the objection.

II. Specification

The Office Action reminds Applicants of the proper language and format for an Abstract of the Disclosure. By this Amendment, the Abstract of the Disclosure is amended as indicated on the attached sheet.

III. Rejection Under 35 U.S.C. §102

The Office Action rejects claim 8 under 35 U.S.C. §102(b) as anticipated by U.S. Patent Application Publication No. 2002/0017234 to Ono et al. ("Ono"). Applicants respectfully traverse the rejection.

By this Amendment, claim 8 is amended to recite, "A method for producing a single crystal by pulling a single crystal from a raw material melt in a chamber in accordance with Czochralski method, comprising pulling a single crystal having a defect-free region which is outside an OSF region to occur in a ring shape in the radial direction and in which interstitial-type and vacancy-type defects do not exist by controlling a V/G value as indicated by a growth rate (V) and a temperature gradient (G) near a growth interface, wherein the

pulling of the single crystal is performed with being controlled so that an average of cooling rate in passing through a temperature region of the melt point of the single crystal to 950 °C is in the range of 0.96 °C/min or more and so that an average of cooling rate in passing through a temperature region of 1150 °C to 1080 °C is in the range of 0.88 °C/min or more and so that an average of cooling rate in passing through a temperature region of 1050 °C to 950 °C is in the range of 0.71 °C/min or more." This claimed method enlarges the production margin for producing a single crystal having an N region. Ono fails to teach such a method.

The Office Action, on page 2, asserts that Ono teaches the fabrication of single crystals via the Czochralski (Cz) method, whereby it is taught that the single crystal product is produced having a substantially defect free region in the DZ (Denuded Zone), which is generally understood to be in existence outside the OSF region. Additionally, the Office Action, on page 3, asserts that Ono teaches a series of cooling rate steps in pulling of the single crystal, which allegedly correspond to the cooling steps of the claimed invention.

However, Ono merely teaches that in order to stabilize and grow an oxide precipitate nuclei in the wafer, the cooling rate in pulling single crystals should be controlled. See Ono, paragraphs [0031] - [0033]. Therefore, Ono does not require any additional heat treatments following pulling up a single crystal, but before an epitaxial step. Without such an intermediate heat treatment step, the oxide precipitate nuclei in the wafer barely vanishes in the epitaxial step and, thus, forms the oxide precipitates. Therefore, the epitaxial wafers disclosed by Ono are capable of exhibiting high IG capability. See Ono, paragraph [0014] and Example 2. However, Ono does not disclose controlling a V/G value at all. Further, Ono does not teach pulling a single crystal having an N region by controlling a V/G value.

The Office Action asserts that paragraphs [0003] - [0004] of Ono disclose the single crystal having an N region of the claimed invention. However, in these paragraphs of Ono, all that is disclosed is that, in the process of device manufacture, oxygen existing near the

wafer surface is diffused to the outside by high heat treatment and thereby a surface layer wherein the device is formed is a DZ layer, which is free of crystal defects. Put differently, the process disclosed in Ono is a process of producing wafers, and thus, unlike the claimed invention, it does not relate to controlling a V/G value in the method of producing a single crystal ingot in accordance with the Czochralski method or pulling a single crystal having an N region.

Additionally, Ono's disclosure is relevant to epitaxial wafers that merely form a region on a surface that is free of crystal defects, but Ono's disclosed process does not relate to pulling a single crystal having an N region in accordance with the Czochralski method or controlling a V/G value, as recited in claim 8. Furthermore, Ono does not disclose controlling the cooling rate at the same time as pulling a single crystal having an N region by the method as claimed. Thus, Ono fails to teach each and every feature of claim 8.

Claim 8 is not anticipated by Ono. Claims 9-23, as currently amended, variously depend from claim 8 and, thus, also are not anticipated by Ono. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachment:
Abstract

Date: October 6, 2008

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